Reinventing the Electric Utility Industry Through Technological Advances

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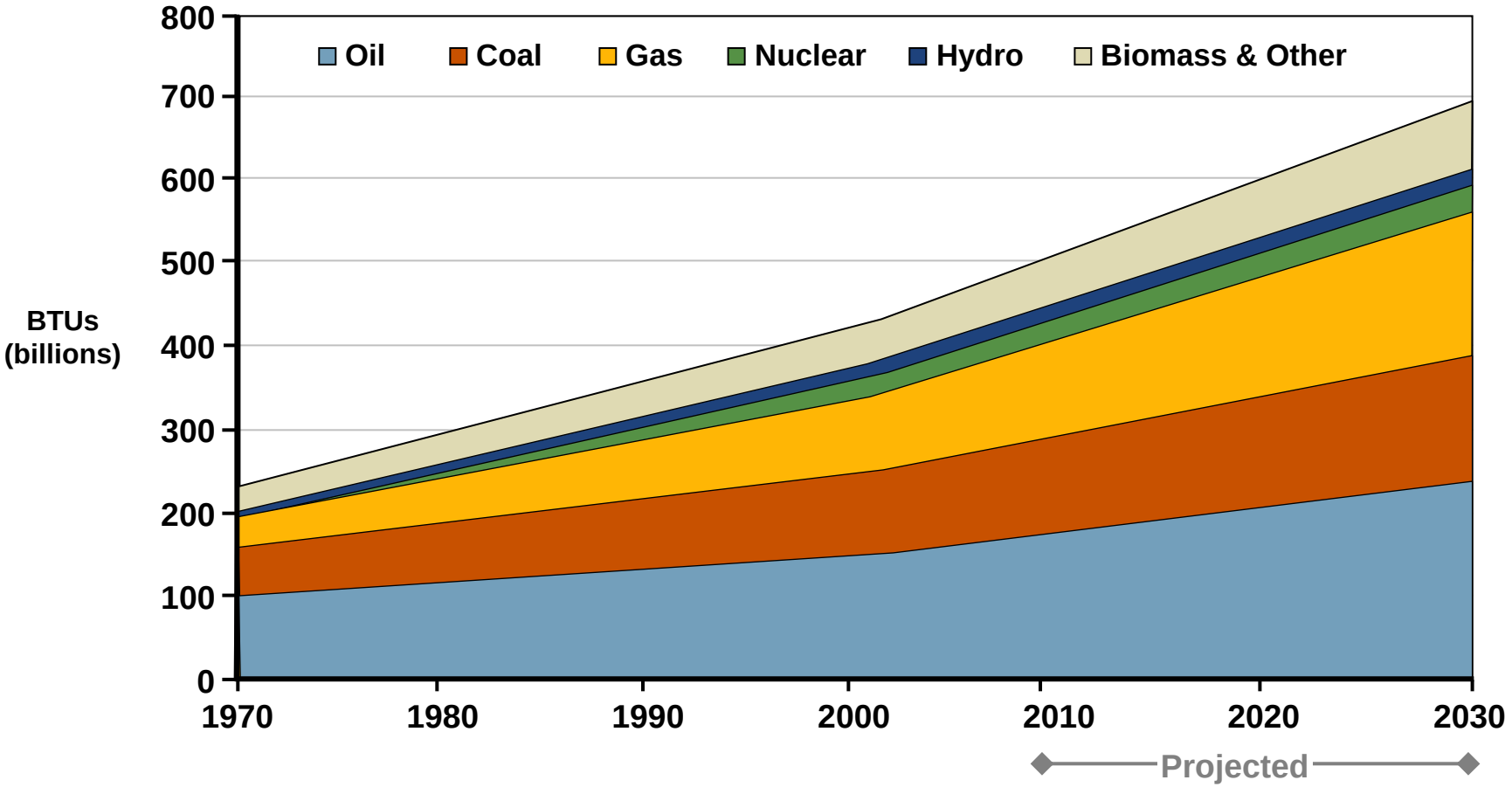
Congratulations

Demand for Energy Projected to Grow Significantly

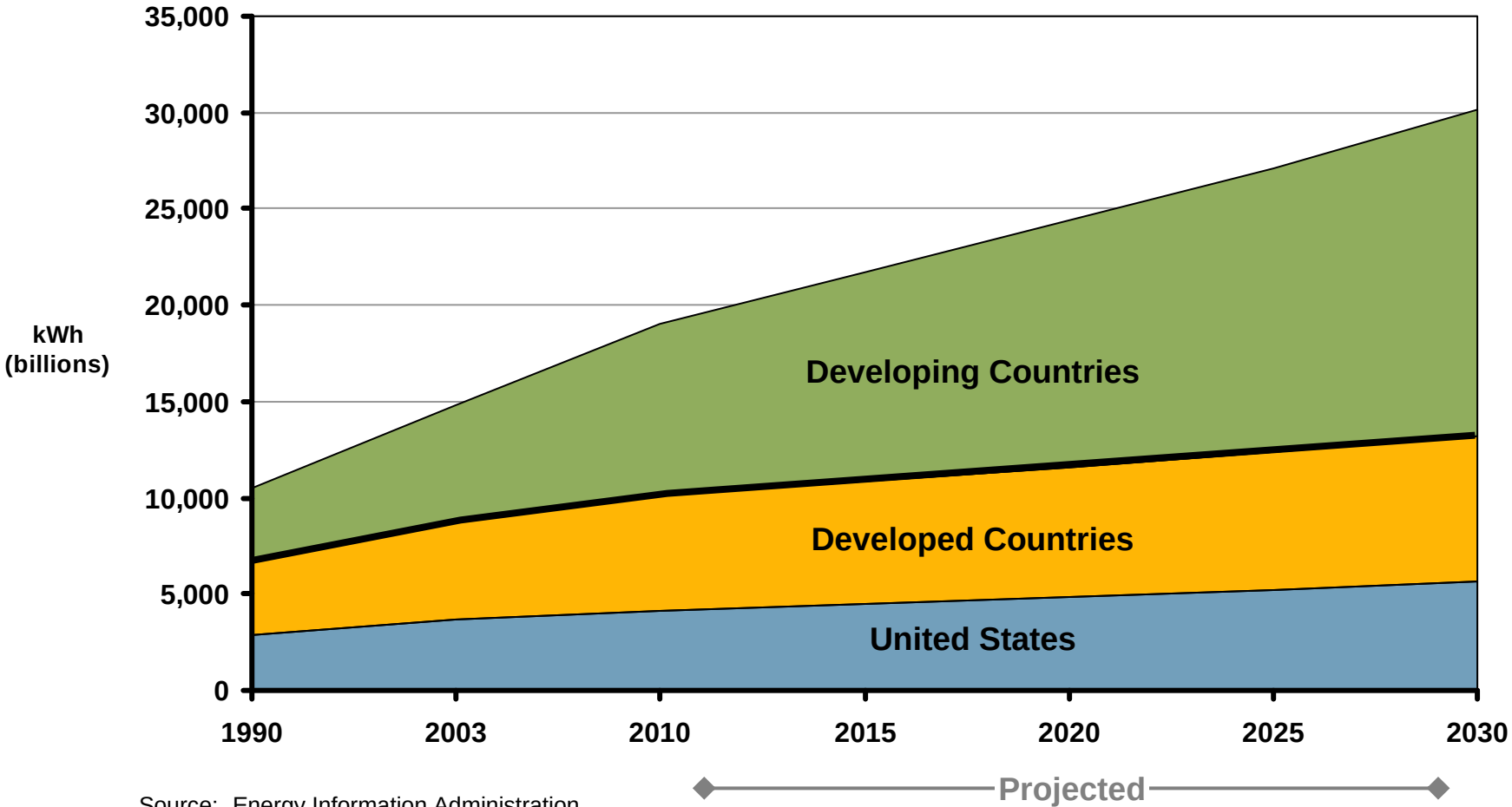
Global Energy Demand



Source: OECD/IEA World Energy Outlook

Demand for Electricity Continues to Rise

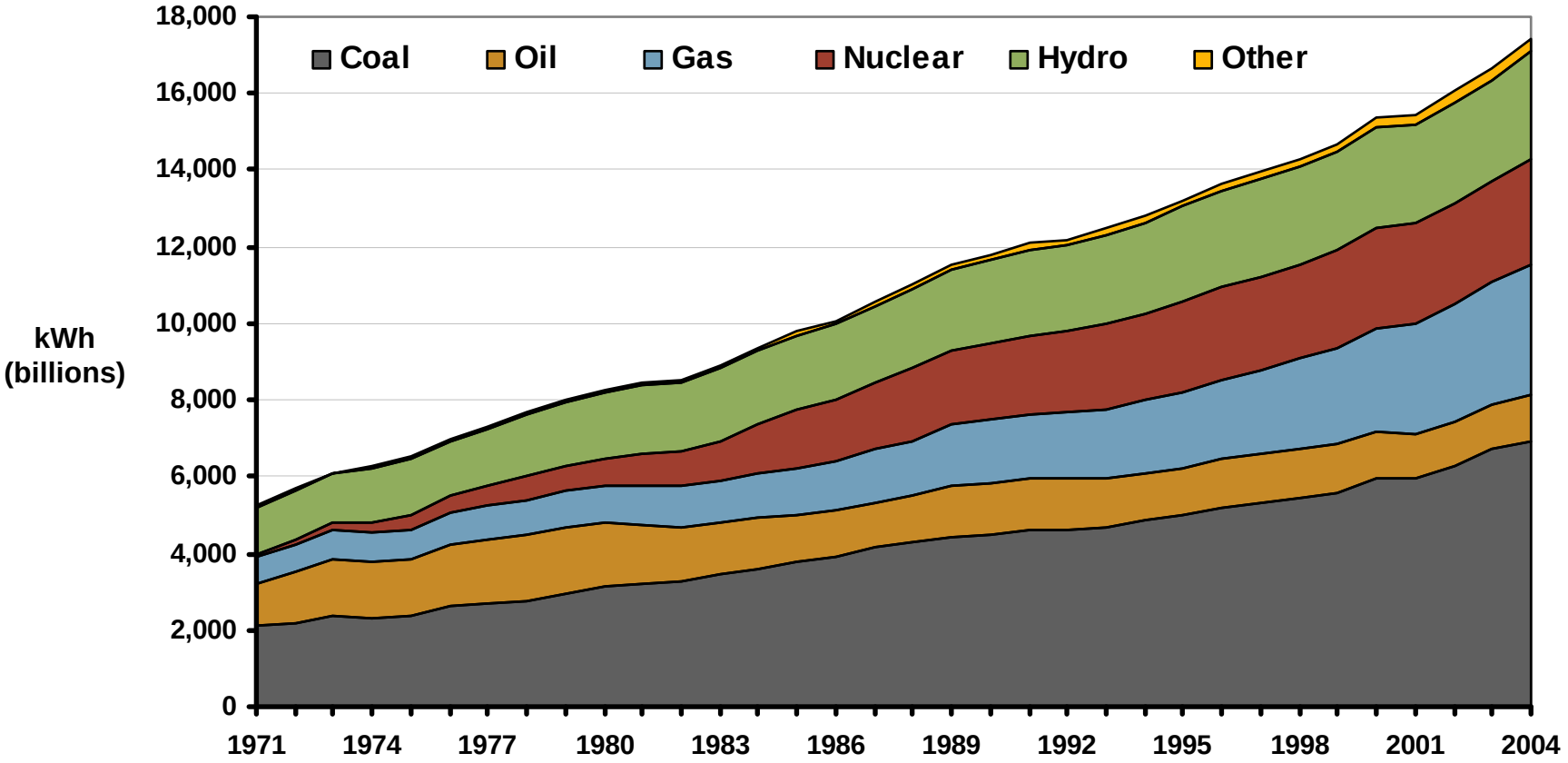
Global Electricity Consumption



Source: Energy Information Administration
International Energy Outlook 2006

Historically, Fossil Fuels Dominate Electricity Generation

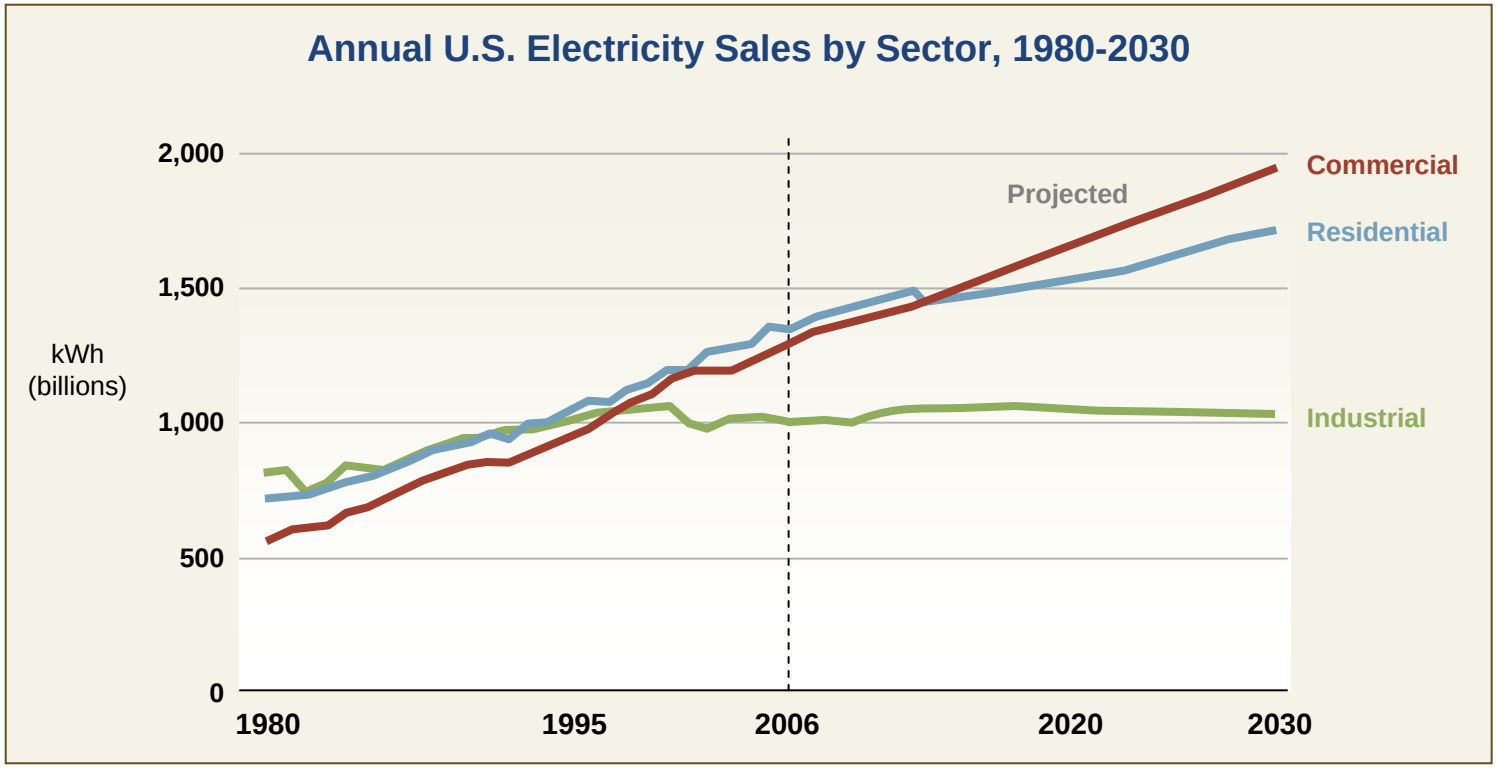
Global Electricity Generation by Fuel



Source: OECD Factbook 2007

U.S. Electricity Consumption Expected to Grow 29% by 2030

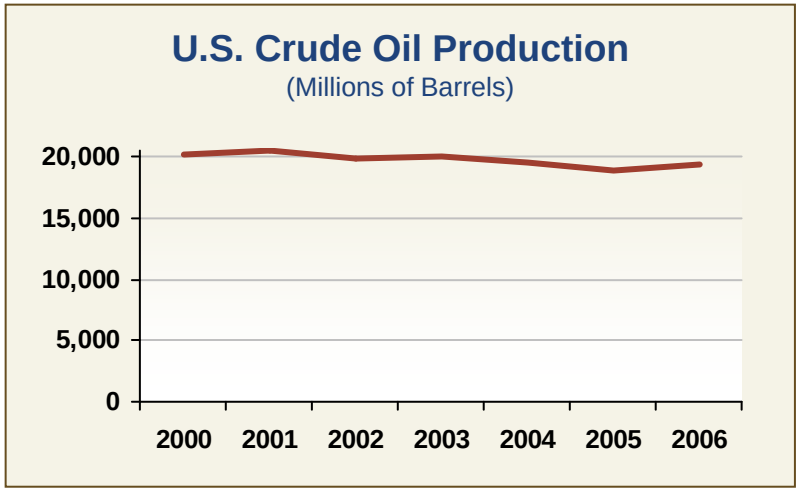
- **Increase driven by computers and other digital technologies**
  - **Television:** Traditional CRT (209 kWh/yr), Plasma (680 kWh/yr)

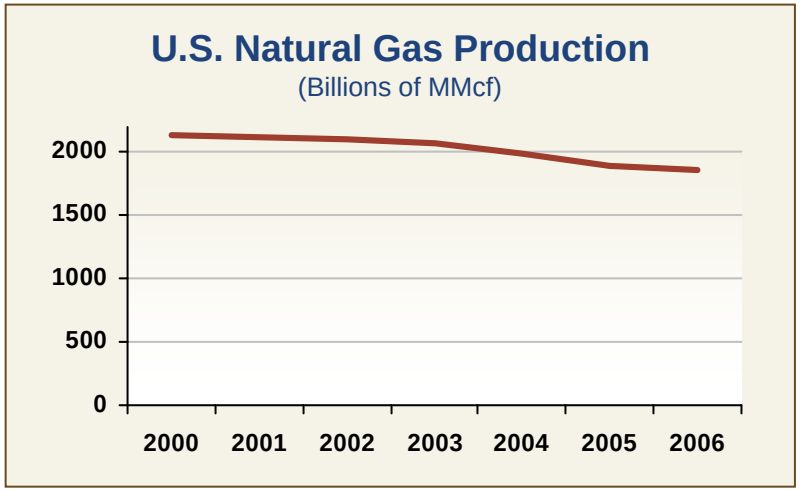


Source: Energy Information Administration, July, 2008

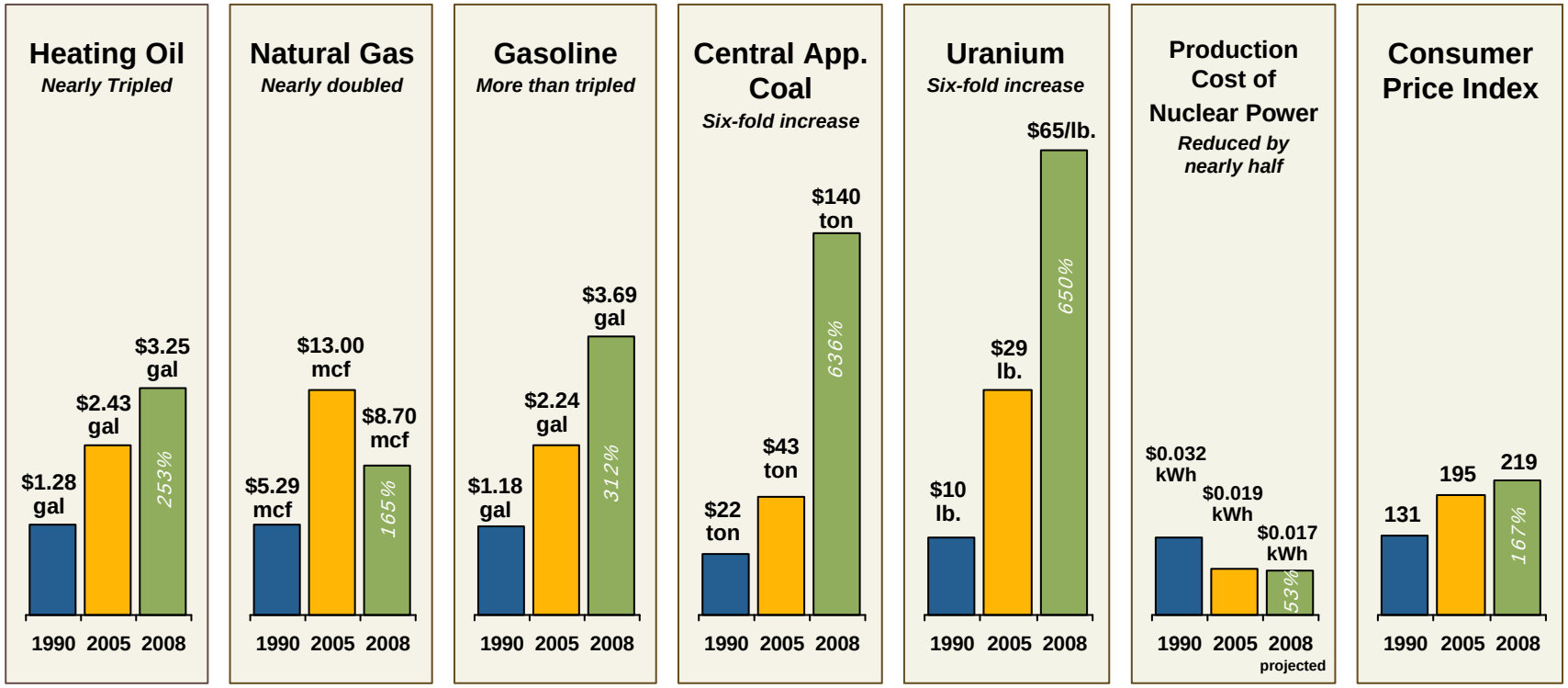
Natural Resource Depletion

- **Global competition for fuel to generate electricity**
- **Natural resource consumption rate unsustainable**
- **Prices for oil, natural gas and coal continue to be volatile in response to unprecedented global demand**
- **Domestic oil and gas production is flat**





Energy Costs Continue to Rise



FENOC Aug, 2008 | FENOC Aug, 2008 | BLS, July, 2008

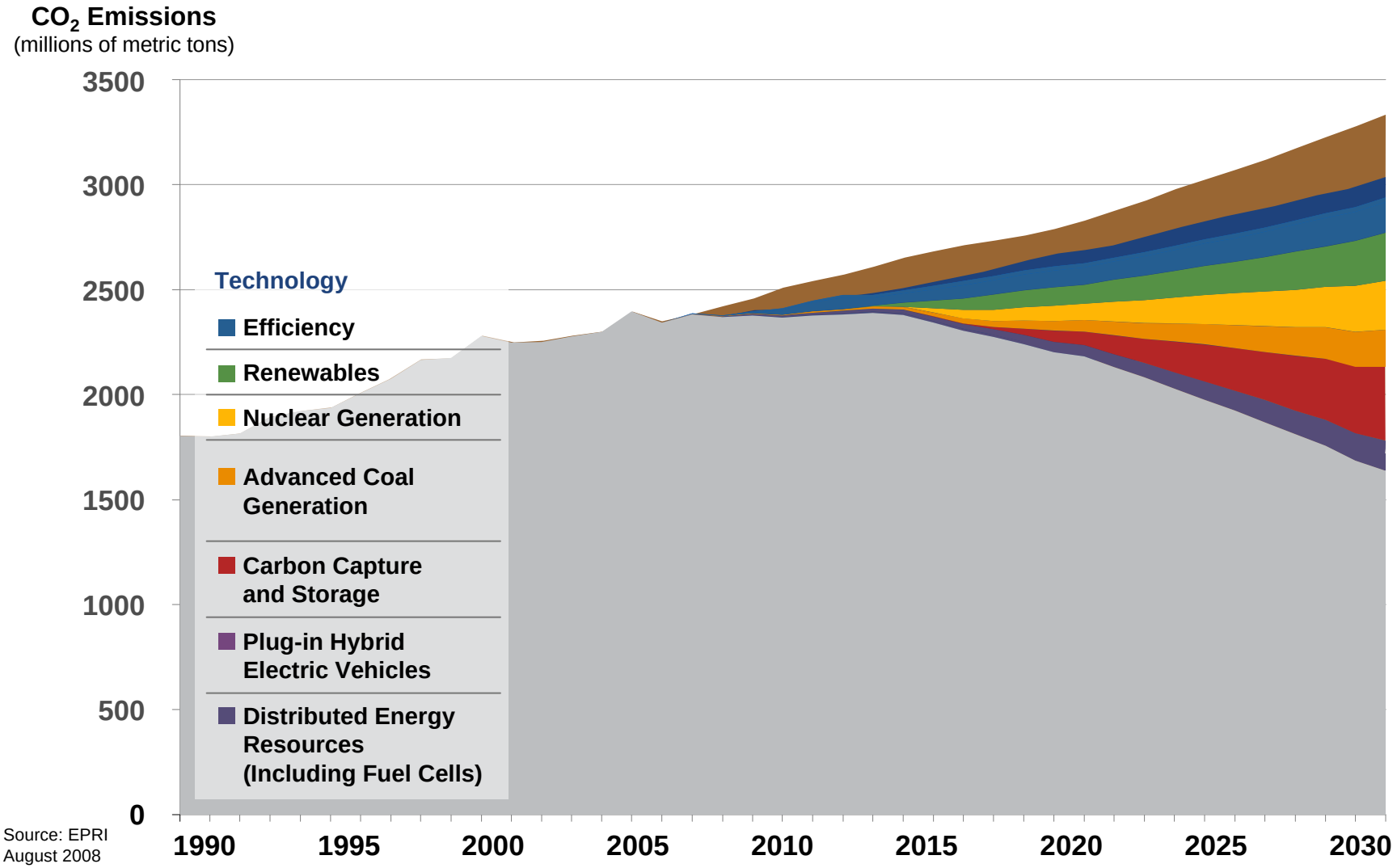
*As of August 13, 2008, 10:00 a.m.

Source: Energy Information Administration unless noted

Environmental Impact a Major Concern

- **Climate change a global issue requiring global response**
  - U.S. coal-based capacity approximately 300,000 MW
  - China added nearly 160,000 MW over past two years alone
  - China expected to reach 400,000 MW by 2010
- **U.S. climate change legislation likely**
  - Significant political uncertainty
  - Judicial ruling vacated Clean Air Interstate Rule (CAIR)
  - Mercury mandates equally uncertain

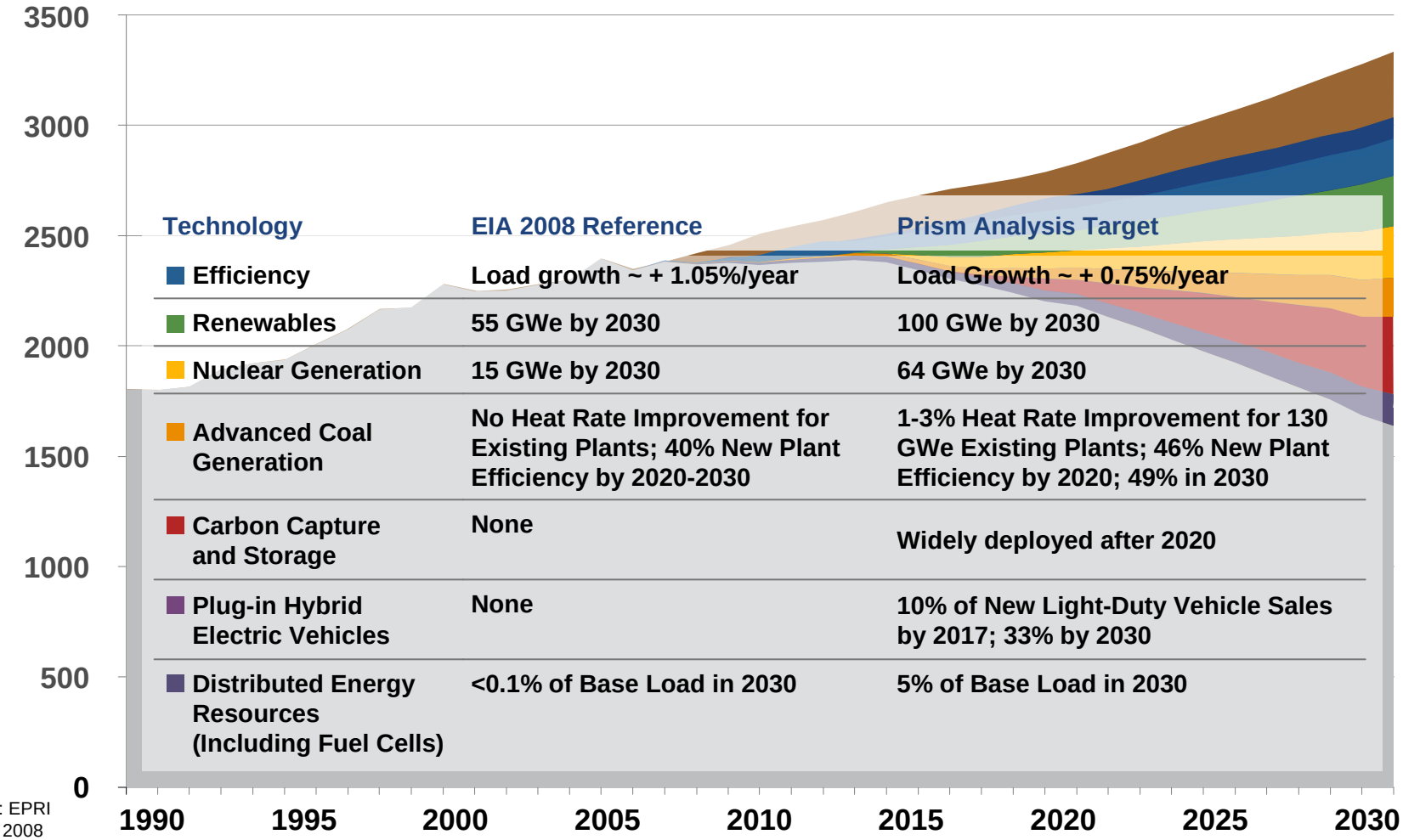
Technical Challenges for Reducing Emissions are Daunting



Source: EPRI
August 2008

Technical Challenges for Reducing Emissions are Daunting

CO_2 Emissions
(millions of metric tons)



Technology	EIA 2008 Reference	Prism Analysis Target
Efficiency	Load growth ~ + 1.05%/year	Load Growth ~ + 0.75%/year
Renewables	55 GWe by 2030	100 GWe by 2030
Nuclear Generation	15 GWe by 2030	64 GWe by 2030
Advanced Coal Generation	No Heat Rate Improvement for Existing Plants; 40% New Plant Efficiency by 2020-2030	1-3% Heat Rate Improvement for 130 GWe Existing Plants; 46% New Plant Efficiency by 2020; 49% in 2030
Carbon Capture and Storage	None	Widely deployed after 2020
Plug-in Hybrid Electric Vehicles	None	10% of New Light-Duty Vehicle Sales by 2017; 33% by 2030
Distributed Energy Resources (Including Fuel Cells)	<0.1% of Base Load in 2030	5% of Base Load in 2030

Source: EPRI
August 2008

Producing Electricity in an Environmentally Sound Manner

- **FirstEnergy companies have spent more than $5B on environmental projects since the Clean Air Act became law in 1970**
- **Our power plant emissions rates are significantly lower than regional average**
- **Since 1990, we've reconfigured our fleet and avoided some 150 million tons of CO_2 emissions**

FirstEnergy Investing Approximately $2B in Environmental Projects

- **Sammis Plant in Stratton, Ohio - $1.65B project**
  - Multi-year environmental retrofit project began in 2006 – completion expected in 2010
  - Designed to reduce SO_2 emissions by 95% and NOx by at least 64%
  - One of the largest environmental retrofit projects in the nation
    - Flue duct work: 9,000 ft.
    - Electrical cable: 10,400 circuits (568 miles)
    - Concrete: 52,000 cubic yards
    - Structural steel: 15,000 tons
- **Burger Plant – $180M project**
  - Evaluating Conversion/Environmental Retrofit Option
- **Mansfield Plant – $50M project**
  - SO_2 control (scrubber) upgrades

Sammis Air Quality Compliance (AQC) Project

Ammonia Storage

SCR Location Inside Building

WFGD Absorber Area

Limestone Prep and Wastewater Treatment

Limestone Storage and Dewatering Area

Sammis AQC Site Model

A/B Absorbers and Building Steel

Hoisting of Modules on Absorber Vessel

Cranker Transformer

Crane City

Dewatering Area and South Yard

Fans Inlet & Outlet Casing

Transport of “C” Flue Section to Chimney

C1-C2 FRP Liner Sections

Ductwork Along the River

Great Wall Ductwork and Steel Erection

Ductwork and Structural Steel of Great Wall

Limestone Prep Building and Conveyor System

Limestone #2 Transfer Conveyor to Limestone Prep Bldg.

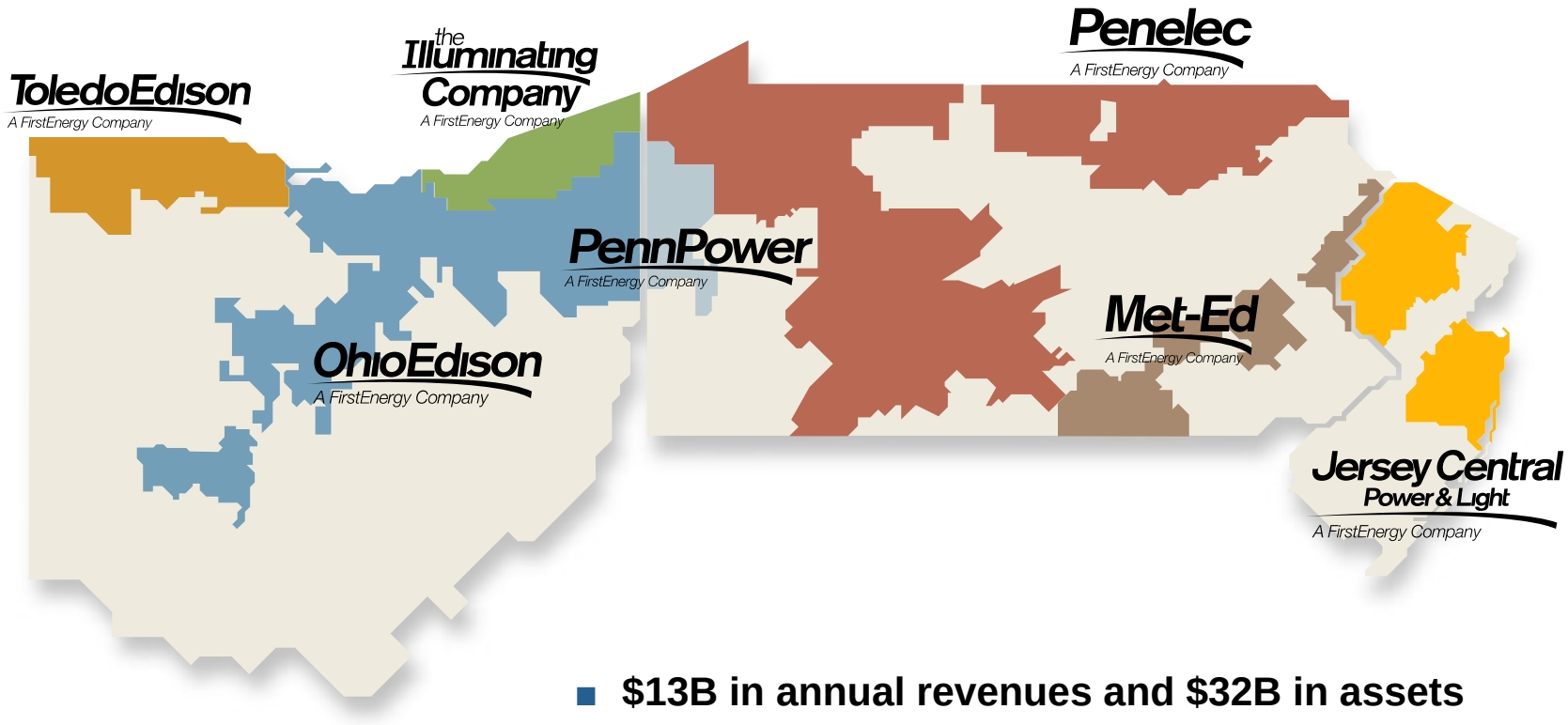
Gypsum Conveyor Sleeper Foundations West from Plant

Hollow Rock Facility Excavation

FirstEnergy Corp.

- **Headquartered in Akron, Ohio**
- **Seven electric utility operating companies**
- **5th largest investor-owned electric system in the U.S. based on 4.5 million customers served**
- **Ranked 209 among Fortune 500 companies in 2008**

FirstEnergy Corp.

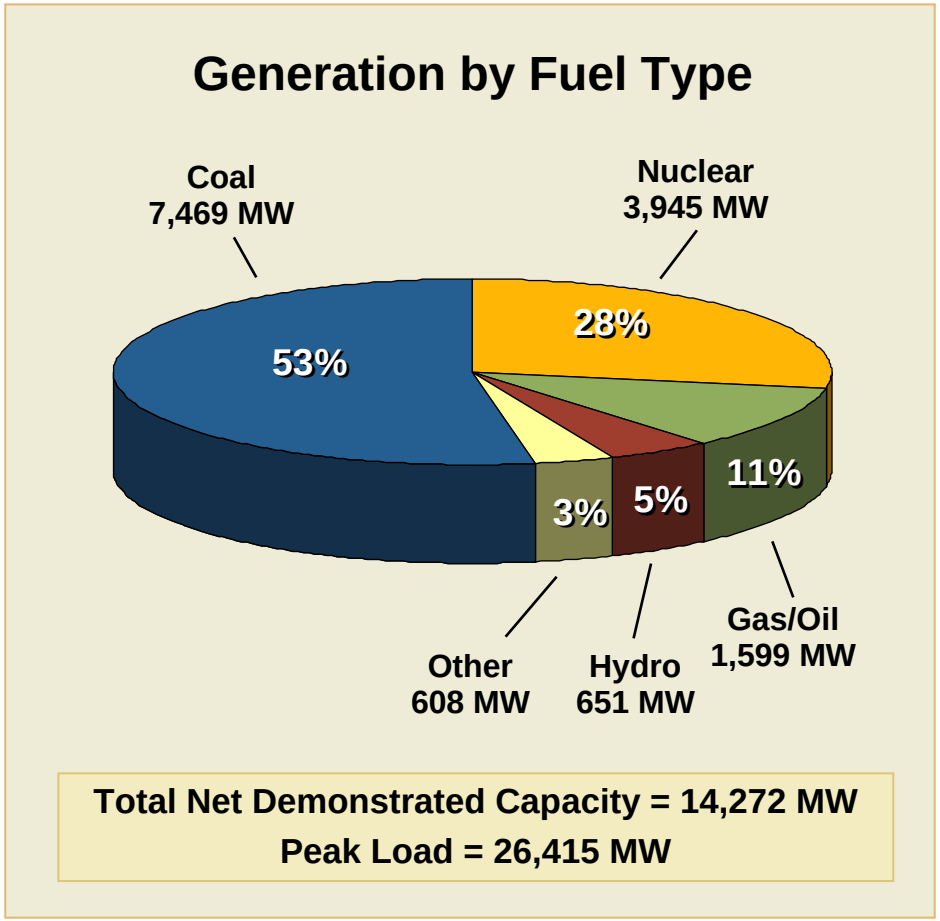


Rankings Among Electric Utilities
(12 mos. ended 12/31/2007)

Assets	11
Customers	5
Revenues	11
Market Cap (as of 2/29/08)	7

- **$13B in annual revenues and $32B in assets**
- **18 generating plants; more than 14,200 MW**
- **Approx. 133,000 transmission and distribution circuit miles**
- **Approx. 14,500 employees**

Diverse Generating Sources



- More than 60 percent of generation comes from non-emitting nuclear, scrubbed coal-based and natural gas peaking plants
- Added 145 MW (115 MW in 2007) of renewable wind to our sources of electric generation

FirstEnergy Steps Up its Efforts to Meet New Requirements

Alternative Energy, Efficiency and Demand Response

- **Ohio legislation**
  - Amended Sub. Senate Bill 221 requires 25% of electricity to come from renewables and advanced energy – including advanced nuclear by 2025
  - Utilities required to meet annual benchmarks starting in 2009
  - Sets annual efficiency benchmarks so that energy use decreases 22% by 2025
- **Energy Efficiency and Demand Management Group**
  - Under new Vice President of Energy Efficiency
  - Responsible for developing demand response, energy efficiency and emerging technology programs
- **Investing in technologies to maximize the efficiency of our coal-based plants**
  - Carbon capture and sequestration research and demonstration
- **Direct Load Control Program**

Leadership Role Testing New Environmental Technologies

FirstEnergy Technology Investments

- **Two, 5-KW, solid-oxide fuel cells installed and tested at Cuyahoga Valley National Park**
- **Targeted investments in wind turbines**
- **Energy Storage**
- **Plug-in Hybrid Electric Vehicles**
- **Advanced Distribution Technologies**
- **Provided $2M grant to The University of Akron to create FirstEnergy Advanced Energy Research Center**

“Conventional Wisdom” Tells Us...

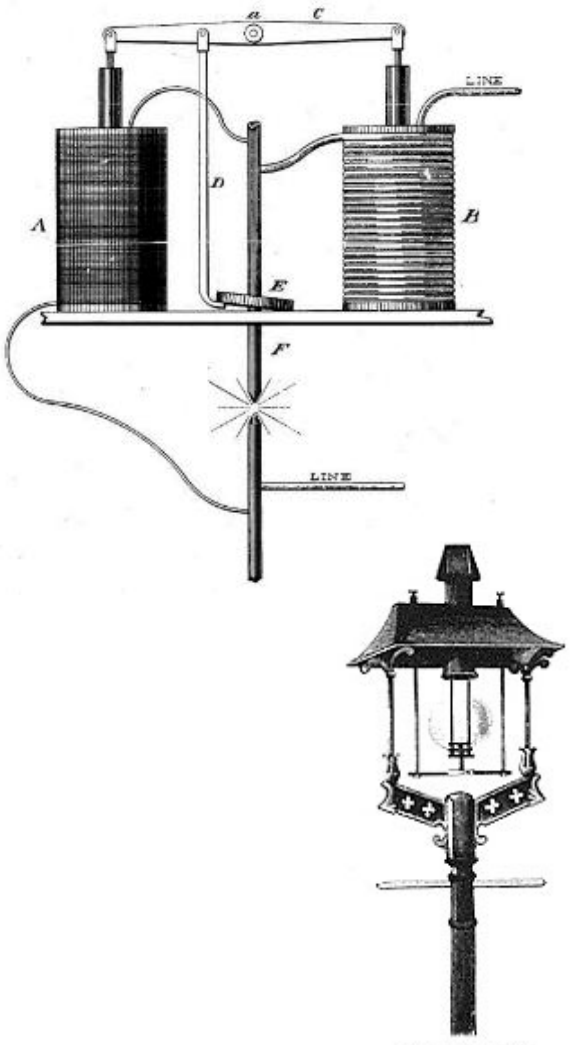
- **Some advanced technologies not ready for large-scale use**
  - Fuel cells
  - Plug-in Hybrid Electric Vehicles
  - Carbon capture and storage
- **Costs**
- **Reliability**
- **Commercial scale**
- **Grid interaction**
- **Fuel availability and storage**

Cuyahoga Valley National Park Fuel Cell

If there’s anything we’ve learned over the course of history, it’s that we can accomplish great things through innovation and strategic deployment of resources.

We've Been Here Before...

- **Experiments to develop light bulb began more than 200 years ago in England**
- **Charles Brush of Cleveland developed arc lighting system and dynamo – an imperfect design**
  - In 1879, first demonstration system installed in Cleveland
  - Produced light by sending current across gap between two carbon rods
  - Lamps flickered, sizzled and sputtered
  - Harsh bluish light unsuitable for home use – and kept chickens from laying eggs



“Constant Danger from Sudden Death”

– New York Evening Post, June 1888

- **Electric light bulb presented countless challenges**
  - Safety concerns with electricity – fires, accidental electrocutions
  - Gas lamp infrastructure well-established and profitable
  - Gas light reliable and familiar
  - Myths: electric lights cause blindness, severe eye pain, freckles

Artificial light: “An attempt to interfere with the divine plan of the world”

“Without the fear of darkness, drunkenness and depravity will increase.”
– Cologne, France, newspaper, 1816

Public Distrust of Edison's Claims that Success Was Within Reach

- **Edison tested 3,000 concepts for incandescent bulbs**
  - Built upon what others had learned
  - Searched worldwide for filament materials
  - Tested more than 6,000 materials; found success with platinum, tungsten

"Why not make a contract with the man in the moon? He'll furnish light half the time anyway."
– Indiana newspaper editor

"I have not failed. I've just found 10,000 ways that won't work."
– Thomas Edison

The Wizard of Menlo Park. Illustration in the *New York Daily Graphic*, July 9, 1879, caricatures Edison searching for platinum to use as a burner in his incandescent lamp.

The Early Light Bulb

- **In 1802, Humphry Davy of Great Britain creates first incandescent light bulb – burns only for a few hours**
- **In 1880, Thomas Edison produces 16-watt light bulb that lasts for 1,500 hours and begins to market his new invention**
  - Introduces integrated electric lighting system powered by central generating systems
- ***Seventy-eight years*** **pass between first incandescent lamp and Edison's commercial success!**

Edison's practical incandescent lamp

"I felt the sense of great responsibility, for unknown things might happen on turning a mighty power loose under the streets and in the buildings on lower New York. However, I kept my counsel."

– Thomas Edison

J.P. Morgan: Early Adopter

- **J.P. Morgan, early financial backer of Edison, showcased advantages of incandescent light in his home**
  - First private residence in New York illuminated solely by electricity
    - More than 385 electric lights
  - Installed coal-powered steam engine and boiler to power two electric generators
    - Engineer arrived daily to “get up the steam” to run generators
  - Speedy advances in electric lighting
    - Morgan replaced entire lighting system after one year
  - Morgan accepted problems large and small were inevitable with new technology

U.S. Electric System Is the Envy of Other Countries

- **Electricity is essential to modern life—advances economic growth and prosperity**
- **Cleanest, most flexible and versatile energy source**
- **99.98% reliable**
- **Electricity remains an outstanding value when compared with other energy sources and basic utilities**

Technological Advances Hold Promise for the Future

- **FirstEnergy applauds the achievements of NASA Glenn Research Center scientists and engineers**
- **Scientific discovery and aeronautic technologies developed here enable powered flight through the atmosphere and beyond**
  - And, have led to numerous improvements to life here on Earth!
- **Hurdles you face may have sounded familiar to Edison**
  - Scientifically unfeasible – can't be done!
  - Unreliable
  - Too expensive
- **Continuing progress of NASA and FirstEnergy led by development and deployment of innovative technologies and research**
- **Technology development is key and FirstEnergy is doing its part**
  - Testing carbon capture and sequestration technology at our R.E. Burger Plant
  - Supporting research involving plug-in hybrid electric vehicles – advanced distribution technology
  - Industry and government collaborations to improve environmental performance